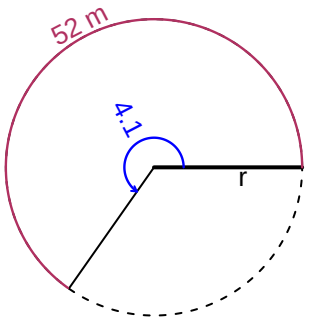
Name: Date:

Trig Final (Solution v27)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.1 radians. The arc length is 52 meters. How long is the radius in meters?

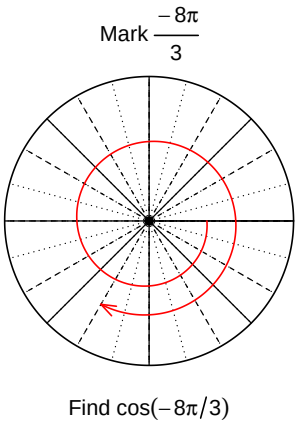


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

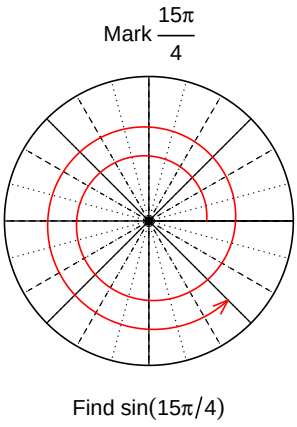
$r = 12.68$ meters.

Question 2

Consider angles $\frac{-8\pi}{3}$ and $\frac{15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{-8\pi}{3}\right)$ and $\sin\left(\frac{15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(-8\pi/3)$



Find $\sin(15\pi/4)$

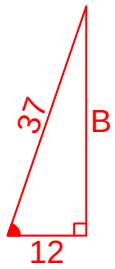
$\cos(-8\pi/3) = \frac{-1}{2}$

$\sin(15\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-12}{37}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

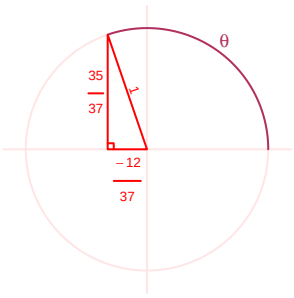
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + B^2 = 37^2$$
$$B = \sqrt{37^2 - 12^2}$$
$$B = 35$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{35}{37}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 7.49 meters, a frequency of 3.58 Hz, and a midline at $y = -4.87$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -7.49\sin(2\pi 3.58t) - 4.87$$

or

$$y = -7.49\sin(7.16\pi t) - 4.87$$

or

$$y = -7.49\sin(22.49t) - 4.87$$